

AGRICULTURAL MECHANICS

CAREER DEVELOPMENT EVENT

Purpose

The Missouri State Agricultural Mechanics CDE shall reflect the agricultural mechanics instruction provided contestants in Missouri secondary agriculture departments. Specifically, the skill and problem solving activities shall reflect the competencies included in the Missouri Agricultural Mechanics curriculum. Agricultural Mechanics competencies shall include the areas of agricultural machinery, small engine power, tractor power, agricultural electrification, woodwork and carpentry, concrete and plumbing, metal fabrication, soil and water management, and repair and maintenance. The written examination, skill activities, and problem solving activities will be conducted to assess the participants' knowledge of these agricultural mechanics competencies. Agricultural Mechanics competency profiles are available through the Instructional Materials Laboratory.

Objectives

The overall purpose of the Agricultural Mechanics CDE is to motivate contestants to greater learning by providing an opportunity to apply classroom knowledge in a competitive situation and to promote state-of-the-art Agricultural Mechanics programs within the State of Missouri. Contestants in the Agricultural Mechanics CDE should have developed the following competencies:

Agricultural Machinery

The contestant should be able to perform the competencies identified in the Missouri Agricultural Machinery Curriculum. Subtopics include operating and maintaining: power units; primary tillage equipment; secondary tillage equipment; planting equipment; chemical applicators; harvesting equipment; and materials and handling equipment.

Small Engine Power

The contestant should be able to perform the competencies identified in the Missouri Agricultural Power I Curriculum. Subtopics include: using measuring tools, principles of operation; using shop tools and equipment; selecting engine parts and fasteners; using a service manual; testing and analyzing a single cylinder engine system; and servicing a single cylinder engine.

Tractor Power

The contestant should be able to perform the competencies identified in the Missouri Agricultural Power II Curriculum. Subtopics include: principles of operation; testing and analyze the multi-cylinder components; servicing a multi-cylinder engine; and servicing the power train.

Agricultural Electrification (circuits and motors)

The contestant should be able to perform the competencies identified in the Missouri Agricultural Structures II Curriculum, Unit D, Agricultural Structures I Curriculum, Unit B, Competency Number 7, and the following specific competencies not in the curriculum that pertain to electrical motors: selecting

motors based on the type of application; interpreting motor nameplate data; interpreting motor wiring connection diagrams; servicing electric motors; connecting motor drives; identifying motors and motor parts; and identifying methods of providing motor protection. References for electric motors are listed in the National FFA Career Development Events, Agricultural Mechanics Section, Pages 13-14.

Woodwork and Carpentry

The contestant should be able to perform the competencies identified in the Missouri Agricultural Construction Curriculum, Units C and E; Agricultural Structures Curriculum I, Unit A; Agricultural Structures Curriculum II, Unit B; Agricultural Science I Curriculum, Material Selection, Plan Reading, and Interpretation Unit; and Agricultural Science II Curriculum, Power Tools Unit.

Concrete and Plumbing

The contestant should be able to perform the competencies identified in the Missouri Agricultural Structures Curriculum I, Unit B; Agricultural Structures Curriculum II, Units A and E.

Metal Fabrication (arc or mig and oxy-acetylene welding)

The contestant should be able to perform the arc welding and oxy-acetylene welding competencies identified in the Missouri Agricultural Science I and II Curriculum materials; Agricultural Construction Unit A, Competencies 1 to 4; and the Agricultural Construction Unit B, Competencies 1 to 10.

Soil and Water Management

The contestant should be able to perform the following competencies in addition to those identified in the current curriculum: describing principles involved in appropriate conservation and/or land use planning; reading legal land descriptions; determining land area; determining the percent of slope or grade; leveling a leveling instrument; using a hand level; taking rod readings; measuring distances with tapes or instruments; laying out corners using instruments; recording field notes for differential and profile leveling; laying out foundations, footings, and batter boards; laying out a contour line; measuring crop residue on the land; determining soil losses; and determine the cubic feet of dirt to move. Global Positioning System (GPS) may be used to better understand land measurement and control erosion. GPS handheld units may be used to determine are, potential cut and fill, etc. The contestant should also be able to perform the competencies identified in the Missouri Agricultural Advanced Crop Production Unit C, "Soil Conservation." References for Soil and Water Management are listed in the National FFA Career Development Events Bulletin, Agricultural Mechanics Section.

Repair and Maintenance (tool ID, sharpening and adjustment, hot metal and cold metal)

The contestant should be able to perform the competencies identified in the Missouri Agricultural Construction Curriculum, Unit D; Agricultural Science I Curriculum, Tool Sharpening and Reconditioning; Agricultural Science I, Woodworking Unit; Agricultural Power I, Units B and C; Agricultural Science II Curriculum, Tool Sharpening and Reconditioning and Cold Metal Work.

Written Examination

The contestant should be knowledgeable about all six areas designated for that respective year.

AGRICULTURAL MECHANICS
CAREER DEVELOPMENT EVENT

Crosswalk with
Show-Me Standards

Objectives – Students participating in the Career Development Event should be able to:		Show-Me Standards	
		Knowledge Standards (Content Areas)	Performance Standards (Goals)
1.	Agricultural Machinery: to perform the competencies identified in the Missouri Agricultural Machinery Curriculum.	CA.3	1.3, 1.4, 1.6, 1.8
2.	Small Engine Power: to perform the competencies identified in the Missouri Agricultural Power I Curriculum.	MA.1, MA.2, MA.3, MA 5, MA.6	3.1, 3.2, 3.3, 3.6 4.4, 4.8
3.	Tractor Power: to perform the competencies identified in the Missouri Agricultural Power II Curriculum.		
4.	Agricultural Electrification: to perform the competencies identified in the Missouri Agricultural Structures II Curriculum	SC.1, SC.4, SC.5, SC.8	
5.	Woodwork & Carpentry: to perform the competencies identified in the Missouri Agricultural Construction Curriculum, Units C and E	SS.5, SS.7	
6.	Concrete & Plumbing: to perform the competencies identified in the Missouri Agricultural Structures Curriculum I, Unit B; Agricultural Structures Curriculum II, Units A and E.		
7.	Metal Fabrication: to perform the arc welding and oxy-acetylene welding competencies identified in the Missouri Agricultural Science I and II Curriculum materials; Agricultural Construction Unit A, Competencies 1 to 4; and the Agricultural Construction Unit B, Competencies 1 to 10.		
8.	Soil and Water Management: to perform the following competencies such as: describe principles involved in appropriate conservation planning; read legal land descriptions; determine land area; determine percent of slope or grade; level a leveling instrument; use of hand level; rod readings; and determine the cubic feet of dirt to move.		
9.	Repair and Maintenance: to perform the competencies identified in the Missouri Agricultural Construction Curriculum, Unit D; Agricultural Science I Curriculum, Tool Sharpening and Reconditioning; Agricultural Science I, Woodworking Unit; Agricultural Power I, Units B and C; Agricultural Science II Curriculum, Tool Sharpening and Reconditioning and Cold Metal Work.		

CORRESPONDING SECONDARY AGRICULTURE CURRICULUM

Course and/or Curriculum:	Agricultural Science I	Unit(s): Agricultural Mechanics
	Agricultural Science II	
	Agricultural Machinery	Agricultural Mechanics
	Agricultural Power I	
	Agricultural Power II	
	Agricultural Structures I	
	Agricultural Structures II	
	Agricultural Construction	
	Advanced Crop Production	Soil Conservation

Event Format and Scoring

1. The three major event sections and associated skill/problem solving areas rotate in the following manner:

CDE FORMAT AND ROTATION Skill and Problem Solving Activities			
Section	Area	Odd Years	Even Years
Ag. Power & Machinery	Ag. Machinery	Ag. Machinery	Ag. Machinery
	Small Engine Power	Small Engine Power	
	Tractor Power		Tractor Power
Ag. Structures & Electricity	Ag. Electrification	Circuits	Motors
	Woodworking and Carpentry	Woodworking and Carpentry	
	Concrete and Plumbing		Concrete and Plumbing
Ag. Construction & Soil & Water Management	Metal Fabrication	Arc or Mig	Oxy
	Soil and Water Management	Soil and Water Management	
	Repair and Maintenance		Repair and Maintenance

2. Each contestant will compete in each area of the CDE. Each contestant will take the written examination.
3. Work will be judged on accuracy, workmanship, and the ability to interpret instructions, plans, and drawings.
4. Each contestant will be allowed 20 minutes to perform the activities in each skill/problem solving area. Each contestant will be allowed 60 minutes to complete the written examination.
5. Skill activity sheets for the district agricultural mechanics event will be distributed at the January district meeting. A brief preview of the event will be provided at the district meetings.
6. Pictures or slides may be used in any area rather than actual items.
7. Problem solving may be a part of the event in any area. The use of computers may be incorporated into the solving of problems that are associated with the six areas designated for that respective year.
8. Practice metal will be provided if necessary. DO NOT bring metal to practice on.

9. Only tools listed on Form 1 (included in following pages) will be used for the tool identification, sharpening, and adjustment skill activity. The contestant should look for the major defect or improper adjustment as they complete this part of the CDE and indicate Useable or Nonuseable under Working Condition.
10. Only parts and tools listed on Form 76 will be used for Ag. Power I.D. Section.
11. The written examination will be an objective test covering the six areas designated for that year.
12. Each skill activity will be worth 50 points. The written examination will be worth 100 points. As such, an individual could earn 400 points; each team could earn a total of 1200 points.

Event Rules

1. Contestants shall not communicate with any person other than the persons in charge of the CDE.
2. Each contestant must bring the following materials:

<u>Odd Years</u>	<u>Even Years</u>
1. #2 lead pencil	1. #2 lead pencil
2. Clean clipboard	2. Clean clipboard
3. Safety glasses	3. Safety glasses
4. Arc or Mig welding helmet	4. Oxy-acetylene goggles
5. Welding gloves	5. Welding gloves
6. Chipping hammer	

No contestant will be permitted to participate without the previous listed equipment.
3. A GPS handheld unit will be provided if it is a part of the event. (See Ag Mech Appendix I & II for examples)
4. Each team will consist of three members who have qualified by participating at a district CDE. Only in Agricultural Mechanics a 4th team member/alternate that participated at the district CDE and is certified by the district may participate in the National CDE on the state winning team. A student that participated in the National CDE event cannot participate at state again in Agricultural Mechanics.
5. Only contestants and CDE workers will be allowed in the CDE area during the event. Teachers will be allowed to view the event set-up only after the event is completed. Teachers will not be allowed to communicate with the judges until event grading has been completed.
6. No CDE papers will be returned after the CDE.
7. Time allowances will be made by the CDE superintendent or assistants for equipment breakdowns or improperly functioning equipment.
8. Contestants will wear safety eye protection during all skill activities. Contestants will not be allowed to compete in an activity without their own safety glasses. Sharing of safety glasses with fellow team members or other contestants will not be allowed.

9. Arc welding and oxy-acetylene participants must wear appropriate clothing and shoes. (i.e. long pants, coveralls or overalls; long sleeve shirt; and leather shoes or boots). All exposed skin must be covered. **NO tennis shoes or sandals will be permitted.**
10. List of machinery for state CDE will be available by March 1st of the CDE year on the UMC Agricultural Engineering website (<http://www.missouri.edu/~pavt0689/statecon.html>) or by calling the UMC Agricultural Engineering office (573-882-2731).

References

References for the CDE are those listed for the respective areas of the Missouri Agricultural Science I and II; Agricultural Structures; Agricultural Power I and II; Agricultural Machinery, and Agricultural Construction Curricula.

References are listed in the Career Development Events Bulletin, Agricultural Mechanics Section:

1. FOS - John Deere
2. *Agricultural Power and Machinery*. McGraw-Hill.
3. *Mechanics in Agriculture*. Interstate Publishers.
4. *Agricultural Mechanics Fundamentals and Applications*. Delmar Publishers.
5. *Modern Agricultural Mechanics*. Interstate Printers and Publishers.
6. *Developing Shop Safety Skills*. American Association for Vocational Instructional Materials (available from UMC-IML).
7. *Power Tool Safety and Operation*. Hobart (available from UMC-IML).
8. *Agricultural Mechanics I Lesson Plans*. UMC-IML.
9. *Agricultural Mechanics II Lesson Plans*. UMC-IML.
10. *Agricultural Buildings and Structures*. Reston Publications.
11. *Practical Farm Buildings*. Interstate Publishers.
12. *National Electrical Code (1993 edition)*. NFPA
13. *Agricultural Structures*. UMC-IML.
14. National FFA Agricultural Mechanics web site:
<http://web.missouri.edu/~pavt0689/natcon.html>.

MISSOURI AGRICULTURAL MECHANICS CDE

AG POWER: SMALL ENGINE PARTS AND TOOL LIST

Tool Number	TOOLS	Tool Number	GENERAL
_____	Tachometer	_____	Air Cleaner Cartridge
_____	Voltmeter	_____	Breather Tube
_____	Ohmmeter	_____	Bushing
_____	Ammeter	_____	Clutch (Starter)
_____	Spark Tester	_____	Connecting Lock/Screw Lock
_____	Compression Tester	_____	Crankcase Breather
_____	Dial Indicator	_____	Cylinder Head Screw (Head Bolt)
_____	Dial Caliper	_____	Flywheel Key
_____	Torque Wrench	_____	Flywheel Guard
_____	Micrometer	_____	Governor Blade
_____	Telescope Gauge	_____	Governor Link
_____	Hole Gauge	_____	Governor Spring
_____	Feeler Gauge	_____	Housing Blower (Shroud)
_____	Wire Feeler Gauge	_____	Muffler
_____	Plug Gauge (Go-no-Go)	_____	Oil Slinger (Dipper)
_____	Valve Seat Refacer	_____	Piston Cap
_____	Valve Lapper	_____	Piston Pin
_____	Valve Seat Cutter	_____	Piston Rod
_____	Valve Grinder	_____	Screen-Rotating
_____	Valve Seal Puller	_____	Spring Washer (Flywheel Washer)
_____	Pilots		
_____	Driver		
_____	Support Jack		PISTON RINGS
_____	Flywheel Puller	_____	Compression
_____	Flywheel Holder	_____	Oil
_____	Starter Clutch Wrench	_____	Scraper
_____	Valve Spring Compressor		
_____	Piston Ring Compressor		IGNITION
_____	Condensor Spring Compressor	_____	Breaker Points
_____	Piston Ring Grover	_____	Breaker Points (Plunger)
_____	Reamer	_____	Breaker Points (Spring)
_____	Cylinder Hone	_____	Condenser
_____	Counterbore Cutter	_____	Cover (Points)
_____	Carbon Ring Remover	_____	Flywheel
		_____	Magneto (Armature)
		_____	Spark Plug
	CARBURETOR		GASKETS
_____	Flow-jet	_____	Air Cleaner
_____	Vacu-jet	_____	Crankcase
_____	Pulsa-jet	_____	Head
		_____	Valve Cover (crankcase breather)
	PRIMARY		
_____	Cam Gear		VALVE
_____	Crankcase Cover (Oil Sump)	_____	Exhaust
_____	Crankshaft	_____	Intake
_____	Cylinder (Block)	_____	Spring
_____	Cylinder Head	_____	Spring Retainer
_____	Fuel Tank	_____	Tappet
_____	Piston		

Missouri Agricultural Mechanics CDE
Tool Identification, Fitting and Adjustment Skill Activity

Name: _____ Contestant Number _____

School: _____ School Number: _____

<u>Tool No.</u>	<u>Condition</u>				<u>Tool No.</u>	<u>Condition</u>			
1. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	26. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
2. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	27. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
3. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	28. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
4. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	29. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
5. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	30. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
6. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	31. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
7. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	32. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
8. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	33. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
9. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	34. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
10. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	35. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
11. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	36. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
12. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	37. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
13. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	38. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
14. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	39. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
15. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	40. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
16. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	41. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
17. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	42. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
18. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	43. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
19. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	44. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
20. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	45. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
21. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	46. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
22. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	47. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
23. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	48. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
24. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	49. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
25. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	50. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>

Missouri Agricultural Mechanics CDE

Tool Identification, Fitting and Adjustment Skill Listing

- | | | |
|----------------------------------|----------------------------------|----------------------------------|
| 1. Bit, Auger | 47. Hammer, Ball Peen | 93. Ratchet, Flex Head |
| 2. Bit, Expansion Auger | 48. Hammer, Blacksmith | 94. Rivet, Set |
| 3. Bit, Masonry | 49. Hammer, Curved Claw | 95. Rivet, Pop Rivet Tool |
| 4. Bit, Router | 50. Hammer, Rawhide | 96. Saw, Back |
| 5. Bit, Screwdriver | 51. Hammer, Ripping | 97. Saw, Compass |
| 6. Bit, Wood Screw Pilot | 52. Hammer, Sheet Metal Setting | 98. Saw, Coping |
| 7. Bit, Spade | 53. Indicator, Dial | 99. Saw, Cross Cut |
| 8. Bolt Cutter | 54. Indicator, Speed | 100. Saw, Hack |
| 9. Brace, Ratchet | 55. Jacob's Chuck | 101. Saw Miter Box |
| 10. Caliper, Inside | 56. Level, Aluminum | 102. Saw, Rip |
| 11. Caliper, Outside | 57. Level, Mason's | 103. Scratch Awl |
| 12. Caliper, Vernier | 58. Level, Mechanic's | 104. Screwdriver, Standard |
| 13. Countersink | 59. Level, Line | 105. Screwdriver, Clutch Head |
| 14. Chalkline | 60. Mason's Trowel | 106. Screwdriver, Offset |
| 15. Chisel, Wood | 61. Micrometer, Inside | 107. Screwdriver, Phillips |
| 16. Chisel, Cold | 62. Micrometer, Outside | 108. Screwdriver, Torque |
| 17. Chisel, Diamond Point | 63. Nail Set | 109. Screw Extractor |
| 18. Chisel, Round Nose | 64. Nut Driver | 110. Sliding T Bevel |
| 19. Clamp, C | 65. Oil Stone | 111. Snips, Aviation |
| 20. Clamp, Corner | 66. Pipe Cutter | 112. Snips, Tinner |
| 21. Clamp, Three Way | 67. Pipe Die | 113. Socket, 4 Point |
| 22. Clamp, Bar | 68. Pipe Reamer | 114. Socket, 6 Point |
| 23. Die, Split Round Adjustable | 69. Pipe Tap | 115. Socket, 8 Point |
| 24. Die, Solid | 70. Plane, Jack | 116. Socket, 12 Point |
| 25. Die, Stock | 71. Plane, Block | 117. Socket, Universal |
| 26. Die, Two Piece Adjustable | 72. Plane, Surform | 118. Socket, Extension |
| 27. Dividers | 73. Plane, Hand | 119. Socket, Flex Handle |
| 28. Edger, Concrete | 74. Pliers, Combination | 120. Socket, Reducer/Adaptor |
| 29. File, Card | 75. Pliers, Diagonal Cutting | 121. Socket, Deep |
| 30. File, Flat Bastard | 76. Pliers, Groove Joint | 122. Socket, Speed Handle |
| 31. File, Flat Mill | 77. Pliers, Lineman's | 123. Socket, Spark Plug |
| 32. File, Half Round | 78. Pliers, Locking | 124. Square, Carpenter's Framing |
| 33. File, Wood | 79. Pliers, Locking Chain Wrench | 125. Square, Combination |
| 34. Float, Magnesium | 80. Pliers, Needle Nose | 126. Square, Steel |
| 35. Float, Steel | 81. Pliers, Slip Joint | 127. Square, Try |
| 36. Float, Wood | 82. Pliers, Water Hose Clamp | 128. Twist Drill, Morris Taper |
| 37. Gauge, Drill | 83. Pliers, Wire Stripper | 129. Twist Drill, Straight Shank |
| 38. Gauge, Flat Feeler | 84. Puller, Bearing | 130. Wrench, Adjustable End |
| 39. Gauge, Spark Plug Feeler | 85. Puller, External Gear | 131. Wrench, Box |
| 40. Gauge, Small Hole | 86. Puller, Internal Gear | 132. Wrench, Combination |
| 41. Gauge, Marking | 87. Puller, Nail | 133. Wrench, Pounds-Foot Torque |
| 42. Gauge, Screw Pitch | 88. Punch, Center | 134. Wrench, Impact |
| 43. Gauge, Telescoping | 89. Punch, Drive Pin | 135. Wrench, Pounds-Inch Torque |
| 44. Gauge, Wire | 90. Punch, Lining-Up | 136. Wrench, Tap |
| 45. Gauge, Sheet and Plate Metal | 91. Putty Knife | 137. Wrench, Ratcheting B |
| 46. Grinding Wheel Dresser | 92. Ratchet, Reversible | |

Appendix I – Agricultural Mechanics

GPS Exercise: Measuring Distance between Two Points

Introduction: The purpose of this exercise is to:

- Familiarize you with the operation of GPS equipment.
- Learn how to measuring distance between two points using GPS.

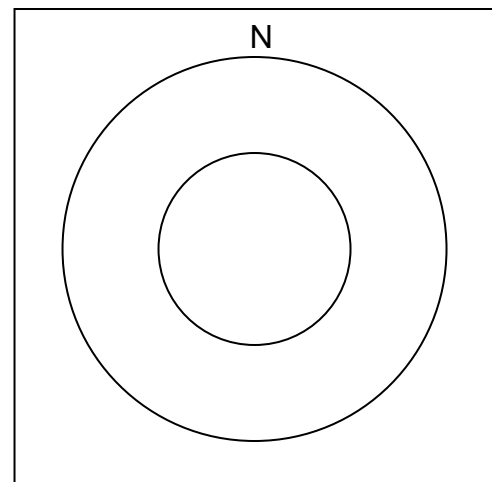
In the Field:

This exercise describes the use of the Garmin GPS 60 (about \$150), but any unit that provides data in decimal degrees UTM coordinates could be used.

1. Turn on the GPS unit by holding the Power Button until the unit powers up. Wait until the unit acquires the GPS satellites. (Pictures of the other screen used in this exercise can be found at the end of the document.)
2. Answer the following questions:
 - a) What is the estimated accuracy shown on the Skyview page? _____ ft.
 This number is based on the satellite geometry. DOP or Dilution of Precision is a similar estimate and is reported on more expensive GPS units.
 - b) Record the satellites in use (dark) on the diagram.
3. The unit should display UTM Coordinates at the bottom of the display. (e.x, Easting (X): 340970 meters and Northing (Y): 4467682 meters).



GPS
or



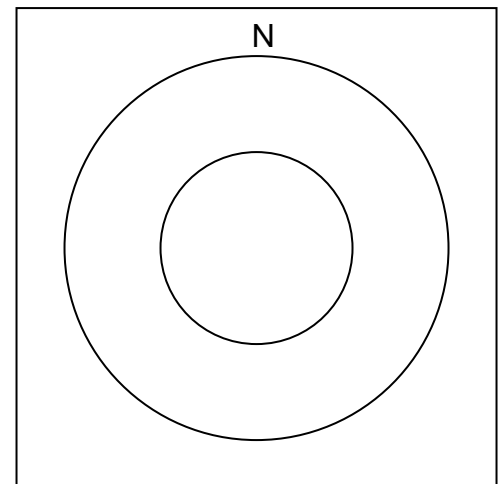
4. Locate the two points marked in the field and take 3 readings at each point.

IMPORTANT: The location of the GPS reading is at the antenna, be sure locate the antenna directly over the point.

5. Write down the readings below (record all of the digits).

Flag Number	Easting (X) (meters)	Northing (Y) (meters)	Accuracy (ft)
1. - 1			
1. - 2			
1. - 3			
Ave 1.			
2. - 1			
2. - 2			
2. - 3			
Ave 2.			

6. Record the satellites in use now.
7. Compare the satellites in use and their position to the diagram when you started the exercise. How have they changed? How did the accuracy change?
8. With the data you have collected, you will know be able to calculate the distance between the two points. You should note the accuracy of the different systems and how this might influence what type of GPS equipment you use for different precision applications.



Distance between point 1 and 2 = _____

Distance Calculation - $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
 1 meter = 3.28 feet

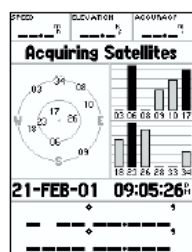
Appendix II – Agricultural Mechanics

Basic Information for Operating a GPS76

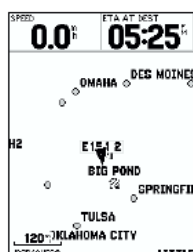
This exercise will provide you with the knowledge and skill to navigate the pages and menus of your GPS 76 with confidence.

As we progress through this Owner's Manual you will often be directed to press a specified Interface Key or highlight a field. When you are directed to press a Key, you should press, then release the Key. If the Key needs to be held down for a period of time, the instruction will tell you. The position of the highlight is controlled by the **ROCKER** Key. When a field is highlighted, a dark strip will encompass the field.

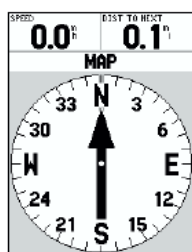
Let's start by taking a look at the five main display pages. They are the GPS Information Page, Map Page, Pointer Page, Highway Page and the Active Route Page. You can cycle through these pages by pressing either the **PAGE** or **QUIT** Key. When the GPS 76 is turned on a Welcome Page will be displayed, followed by a Warning Page. Acknowledge these pages by pressing the **PAGE** Key while they are displayed. The GPS Information Page will now be displayed.



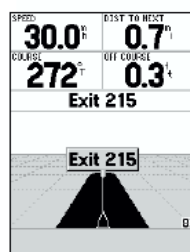
GPS Information Page



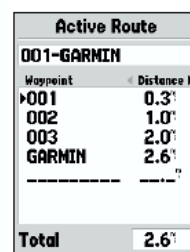
Map Page



Pointer Page



Highway Page



Active Route Page

GPS Information Page

The GPS Information Page displays your speed, elevation, the estimated accuracy, receiver status, satellite locations, satellite signal strength, the date, time and the GPS receiver's current location.

Speed, Elevation and Estimated Accuracy

When the GPS is receiving at least three satellite signals, it will provide you with the current GPS Speed and the estimated Accuracy of the GPS Location. The GPS must be receiving at least four satellite signals to report the Elevation.

Current GPS Receiver Status

The current status of the GPS receiver will always be displayed.

Autolocate — Forces the receiver to search for each satellite individually.

Acquiring Satellites — The receiver will begin in this mode each time the unit is turned on. The GPS receiver will remain in this mode until it has acquired at least 3 satellite signals.

2D GPS Location — Indicates that the receiver is only using three satellite signals. When a 2D GPS Location is achieved, the GPS will display your current position but is incapable of providing an altitude reading.

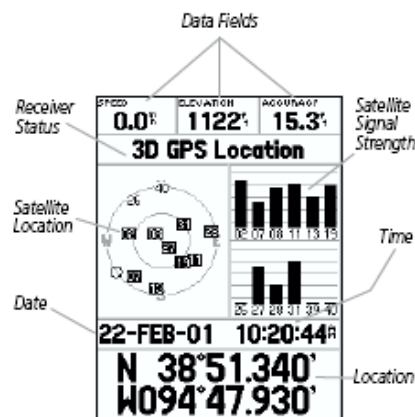
3D GPS Location — Indicates the receiver is currently using at least four satellite signals and is capable of providing your current position and altitude. A "D" will be displayed in or above the indicator bar for each differentially corrected satellite.

2D Differential Location — Indicates the receiver is using DGPS or WAAS differential data on three satellites. A "D" will be displayed in or above the indicator bar for each differentially corrected satellite.

3D Differential Location — Indicates the receiver is using DGPS or WAAS differential data on at least four satellites.

Lost Satellite Reception — Indicates that the GPS receiver has lost satellite reception.

Simulating GPS — Indicates the GPS 76 is running in Simulator Mode and the GPS receiver is turned off. It is important to remember when you are using the Simulator, the GPS 76 can not be used for actual navigation.

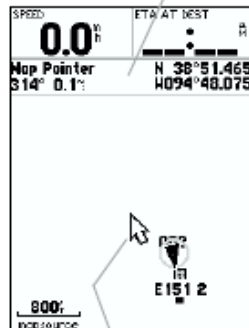


GPS Information Page

Getting Started

Basic Navigation

Bearing and Distance from Pointer to current GPS location.



Map Pointer

Going to a waypoint:

1. Press the **NAV** Key.
2. Highlight 'Go To Point' then press the **ENTER** Key.
3. Highlight 'Waypoints' then press the **ENTER** Key.
4. Highlight 'MAP 1' then press the **ENTER** Key.
5. Highlight the 'Goto' Button then press the **ENTER** Key.

The GPS 76 is now navigating to the waypoint MAP 1.

For a GPS to navigate, it has to be moving, and fortunately you can simulate movement in the GPS 76. Press the **PAGE** Key until the Pointer Page is displayed. Along the top of the Pointer Page there are several data fields. The Speed Field is located in the upper left corner. To simulate movement, press the **ROCKER** Key up one time. This will set a speed of 10 miles per hour. If you continue to press or hold the **ROCKER** Key, the speed will increase in 10 mph increments. For our purpose, 10 mph is fine.

The Pointer Page displays a Pointer and a Compass Ring. The Pointer will always point toward your destination (Bearing) while the Compass Ring reflects the direction that you are traveling (Track). In short, when you are headed directly toward your destination, the Pointer will be pointed toward the top of the display, aligned with the vertical line on the Compass Ring. If you are no longer heading toward your destination, the Pointer will turn away from the top of the display to point toward your destination. To get headed toward your destination again, turn until the Pointer is realigned with the vertical line in the Compass Ring and pointed toward the top of the display.

The simulator will let you change the Track so that you can see what will happen. Press the **ROCKER** Key to the right until your Track has changed about 40°. This will simulate a direction change to the right. The Pointer should now be pointed toward the left of the display indicating that you need to turn to the left to head toward the waypoint. This is exactly what will happen during actual navigation.

You should now have enough knowledge to navigate through the main pages, Option Menus and enter data into your GPS 76. Now let's learn how to navigate!

The main use of a GPS is to be able to navigate to a known position. We have already created a waypoint and named it CREEK. Let's create another waypoint on the Map Page using a different method, the Map Pointer.

Press the **PAGE** Key until the Map Page is displayed. Press the **IN** Key several times until the Zoom Scale in the lower left corner of the Map Page reads 800 ft. The current GPS location is indicated by the triangle in the center of the map.

To display the Map Pointer:

1. Press the **ROCKER** Key any direction.

Using the **ROCKER** Key you can pan the Map Pointer around the map. As you move around the map, the direction and distance from the Map Pointer to the current GPS location is displayed along the top of the map.

To mark a waypoint using the Map Pointer:

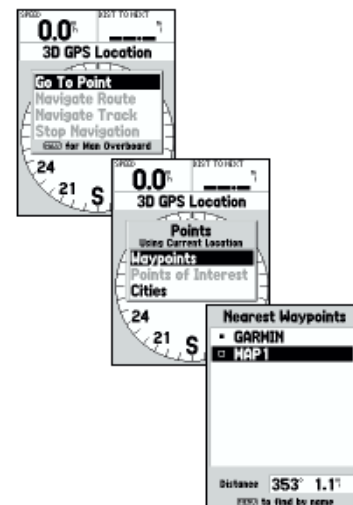
1. With the Map Pointer at a location on the map about one mile from your current location, and not on a road or map feature, press the **ENTER** Key.

The location of the Map Pointer will be captured and the New Waypoint Page will be displayed. Change the waypoint name to MAP 1, and store the waypoint in memory by highlighting the 'OK' Button then pressing the **ENTER** Key. Press the **QUIT** Key to hide the Map Pointer and center the map on the current GPS location.

Now that we have a destination, navigating to it is just a step away.

Getting Started

Basic Navigation



Selecting a waypoint for navigation